ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 5, Issue 4, April 2018

A Study on Mining Applications in Uncertain RFID Data

[1] N.Bala Vignesh, [2] Dr. V. Joseph Peter
[1] Research Scholar, [2] Associate Professor

Abstract: RFID technology is an emerging technology uses radio frequency waves to transfer data between readers and tagged objects, and provides fast data collection with precise identification of objects with unique identifications without line-of-sight. RFID technology consists of data gathering, distribution, and management systems that have an ability to identify or scan information with increased speed and accuracy. RFID technology can be used for locating, tracking and monitoring physical objects. Sensors in RFID devices are intrinsically sensitive to environmental factors. The signal from sensors suffers from high uncertainties due to the nature of signal fluctuation in real-world conditions. The uncertainties that exist in RFID data complicate tasks of determining objects positions and containment relationships. This technology has significant advantages, RFID has been widely used for access control, objects tracking, smart box, highway tolls, logistics and supply chain, security and healthcare, etc. In particular, RFID has been adopted and deployed to collect various types of data in the manufacturing field. In this paper we focus on study of data mining applications of uncertain RFID data.

Index Terms — Data Mining, RFID, Uncertain

I. INTRODUCTION

Radio frequency identification (RFID) technology is an emerging technology uses radio frequency waves to transfer data between readers and tagged objects. In recent years, RFID technology has been increasingly used in many different fields. RFID is very useful for a large number of businesses, and it is a flexible and relatively low-cost solution for tagging and wireless identification.

RFID technology provides fast data collection with precise identification of objects with unique identifications without line-of-sight. RFID technology consists of data gathering, distribution, and management systems that have an ability to identify or scan information with increased speed and accuracy.

An RFID system usually comprises of three key components are i) RFID tag; ii) RFID reader; and iii) RFID antenna.

A. RFID tag

RFID tags, or simply "tags", are small transponders that respond to queries from a reader by wirelessly transmitting a serial number or similar identifier. In RFID systems, the type of tag that is holding the information plays an important role in evaluating the efficiency and performance of the system. RFID tags can be classified into active tags and passive tags.

Active tags: RFID tags fall into two general categories, active and passive, depending on their source of electrical power. Active RFID tags contain their own power source, usually an on-board battery.
Passive tags: Passive tags obtain power from the signal of an external reader. Passive tags, on the other hand, are very inexpensive and new technologies are constantly making them cheaper to integrate into common materials and products. Because passive tags are inexpensive, they will likely be the basis of most of the growth in RFID implementations.

B. RFID reader

The RFID reader is a transceiver that transmits the Radio Frequency (RF) signals using the connected RFID reader antenna. The RF signal can both energize an RFID tag and read the information stored in the tag and transfer the information to a processing device through the transceiver. RFID readers also come in active and passive varieties, depending on the type of tag they read.

C. RFID antenna.

The RFID antenna together with the reader provides the means for not only transmitting its information to a tag but also converts the radio waves scattered back from the RFID tag into digital information that can then be passed on to backend systems for further processing.

ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 5, Issue 4, April 2018

RFID applications typically consist of RF tags that are used as electronic product codes (EPCs). RFID are heavily used to track items and to label items. They are usually thought of as an advanced barcode. However, their possible area of use is much larger. RFID applications across independent enterprises share traceability data of massive objects such as positions and historical trajectories.

II.UNCERTAINITIES IN RFID

The unique characteristics of massive RFID data pose many challenges center on uncertainties. The RFID reader-tag detection uncertainty comes from the inherent unreliability of the RFID technology due to the collisions between RFID devices and interference from the surrounding environment. The performance of an RFID network is largely affected by detection uncertainty, which should be considered in the network planning phase to minimize its negative impact.

The uncertainties in RFID data may result in missing readings, inconsistent data, ghost data, and redundant data.

Missing readings: In real situations, RFID readings are noisy. Failure to detect tags in the read range of a reader might be due to a variety of causes which result in weak or no signal readings that are eliminated by the physical effects. Generally, most of uncertain RFID data are missing data.

Inconsistent data: An RFID object might be read by different RFID readers at the same time, so the object may have inconsistent position data according to positions of RFID readers. It is difficult to identify the correct positions for some RFID objects with such position data.

Ghost data: Radio frequencies might reflect in reading areas, so RFID readers might read the reflections. This can cause RFID readers to obtain inexistent RFID objects.

Redundant data: RFID readers frequently read RFID objects, which can create massive amount of data. The stored data may include significant amounts of redundant information such as unchanged object positions. Redundant and useless data are easy to be filtered by identifying their unique identifiers.

Incomplete data: EPC-tagged objects might be stolen. Stolen objects' data might not appear in the downstream of the supply chains. Fakes are normally produced by an abnormal manufacturer in the midstream and the downstream of the supply chains.

Uncertainties significantly complicate tasks of determining objects' positions and other information in RFID-based traceability supply chains. It is necessary to model uncertain RFID data under a unified model, and to preprocess the uncertain data. It still faces the challenges to resolve uncertainties for effectively and efficiently tracing objects. Uncertainties in RFID-based applications are becoming an active and important research area.

III. APPLICATIONS

A. Health care

Healthcare systems are a very important part of the economy of any country and for the public health. In health care, a system is needed to implement (i) a smart patient management, and (ii) monitoring and tracking process to automate and organize their information management. RFID technology is used to track patients by generating a unique ID. Patient information will be retrieved from the database using this ID. The system will provide a cost-effective means of increasing reliability, privacy and security in the management of healthcare record. This ID is then linked to all recordings of the patient's vital signs and saved in a database for further analysis and historical consultation. The system will also provide real-time patient monitoring of vital signs during their stay in an emergency and critical care unit in a hospital. It also alerts hospital staff if any abnormality is detected.

B. Supply Chain Management

A wide spectrum of applications driven and improved by trajectory data mining, such as path discovery, location/destination prediction, movement behavior analysis for individual or a group of moving objects, making sense of trajectories and other applications of urban service. To efficiently manage indoor moving objects, whose positions are detected by technologies, such as RFID. These applications significantly benefit the common people, commercial organizations and government agencies.

C. Tracking object

RFID is one of the most exciting technologies that revolutionize the working practice by increasing efficiencies, and improving profitability. It is also presented as a converting of today's barcodes. This

ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 5, Issue 4, April 2018

innovative technology has much largest possibilities such as individual serial numbers for each items, and the possibility to read these numbers at a distance of several meters. The evolution of wireless sensor networks uses RFID Technology in the implementation of Fisher Boat Tracking System, Railways, transport system etc.

D. Logistics

In the field of E-logistics, it combines RFID for data acquisition, Data Mining for knowledge discovery and enterprise applications. To mine the associations between the distribution nodes and product quality within a product distribution logistic network on the basis of RFID datasets.

E. Highways

Heavy traffic on highways more time is taken to collect the toll and vehicle consume more fuel when they are in queue. It also increases the travel time of vehicles. RFID based Highway Toll Collection system allows vehicles to go through toll booths without halting and the toll amount gets deducted from the rechargeable account on record. There are various technologies being used world-wide like Dedicated Short Range Communications, Vehicle Identification System using number plates, Radio Frequency Identification decided up on implementing RFID system due to its beneficial features.

F. Access control

Radio frequency identification technology has been widely adopted in access control system. An access control system combining RFID technology and other technologies such as face recognition may be the better authorized one.

IV.CONCLUSION

RFID technologies are increasingly applied in large-scale of applications. Such applications bring some fundamental research and development issues. Uncertainty is one such critical issue in the majority of RFID-based applications. Consequently, we need to propose novel solutions to effectively mine the uncertain data in RFID applications. The area of RFID data with uncertainties presents many interesting challenges and opportunities that need to be mined.

REFERENCES

[1] Akshay Athalye, Vladimir Savi´c, Miodrag Boli´c, and Petar M. Djuri´c, "Novel Semi-Passive RFID System for Indoor Localization," IEEE Sensors Journal, vol. 13, no. 2, pp. 528-537, February 2013.

[2] Tsan-Ming Choi, " Coordination and Risk Analysis of VMI Supply Chains with RFID Technology," IEEE Transactions On Industrial Informatics, vol. 7, no. 3, pp. 497-504, August 2011.

[3] Zheng Gao, Yongtao Ma, Kaihua Liu, Xinlong Miao, and Yang Zhao, "An Indoor Multi-Tag Cooperative Localization Algorithm Based on NMDS for RFID," IEEE Sensors Journal, vol. 17, no. 7, pp. 2120-2128, April 2017.

[4] Tsan-Ming Choi, Wing-Kwan Yeung, T. C. Edwin Cheng, and Xiaohang Yue, "Optimal Scheduling, Coordination, and the Value of RFID Technology in Garment Manufacturing Supply Chains," IEEE Transactions On Engineering Management, 2017.

[5] Jiawei Han, Hector Gonzalez, Xiaolei Li, and Diego Klabjan, "Warehousing and Mining Massive RFID Data Sets," Springer-Verlag Berlin Heidelberg, pp. 1–18, 2006.

[6] Alp Ülkü, "The Next Generation in Personnel/People Tracking Active RFID technology has allowed for enhanced security and safety," IEEE Consumer Electronics Magazine, October 2017.pp. 122-

[7] Henning Baars, Hans-Georg Kemper, Heiner Lasi, Marc Siegel, "Combining RFID Technology and Business Intelligence for Supply Chain Optimization – Scenarios for Retail Logistics," IEEE International Conference on System Sciences, 2008.